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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/088,441	06/27/2002	Timothy S Fisher	N8323-EAS	9157

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WADDEY & PATTERSON
414 UNION STREET, SUITE 2020
BANK OF AMERICA PLAZA
NASHVILLE, TN 37219

EXAMINER	
TAMAI, KARL I	

ART UNIT	PAPER NUMBER
2834	

DATE MAILED: 03/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/088,441	FISHER ET AL.	
	Examiner	Art Unit	
	Tamai IE Karl	2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 September 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *39-43,45-47,49,51,56 and 59-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *39-43,45-47,49,51,56 and 59-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 March 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The objection to the disclosure is withdrawn.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the dopants within the cathode (claim 61) must be shown or the features canceled from the claim. No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 45-47, and 51 are rejected under 35 U.S.C. 102(b) as being anticipated by Geis et al. (US 5,713,775). Geis teaches an energy conversion device for emitting electrons from a diamond emitter from an enhanced geometric tip, which converts the input current to an emitted electron current by band bending. Geis teaches the tip 34 integral with the base 30. Geis teaches the conversion device in a vacuum, with a

micro-nanoscale emitter doped with nitrogen. Geis teaches the anode and cathode reversed biased (figure 2a). It is inherent at there is a power and heat transfer from the base to the anode with the field emission, and that the emission occurs at the base of the tip and at the vacuum. Geis teaches in figures 7a-7c (col. 9, example 3) a gated cathode to bias the cathode over the anode, with an enhanced diamond tip 34 and a gate 32. Geis teaches an electronic device (voltage source/voltage bias) connected to the base electrode 22 with an interface to at the diamond tip cathode 24 and an anode 28, where the band bending occurs at the interface.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 39, 40, 45-47, and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 5984752) and Niigaki et al. (Niigaki)(US 5959400). Tanaka teaches a vacuum thermionic cooling device or a having microtip diamond emitters 26 having a semiconductor band gap. The geometric tips of the diamonds projecting from the film inherently causing band bending from the carbon cathode film. Tanaka teaches the cathode connected to a heat source, with heat being pumped to the anode upon the application of a current to the cathode form a power supply. Tanaka teaches the diamond is hydrogen doped to improve conductivity (band bend). Tanaka teaches every aspect of the invention except Tanaka does not teach the diamond being polycrystalline, the voltage source between the anode and the gate, and a porous gate grid. Niigaki teaches that diamond field emitter cathodes are preferably polycrystalline diamond for electron emission efficiency. Niigaki teaches the voltage between the anode and the gate to provide stable operations where the gate is a porous gate with annular holes (figure 13) to provide a two dimensional array device. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the device of Tanaka with the polycrystalline diamond emitter to provide efficient electron emissions, and with a voltage source between the gate and anode to provide stable operation, and with grid gate to provide larger a two dimensional device.

8. Claims 41-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 5984752) and Niigaki et al. (Niigaki)(US 5959400), in further view of Kumar (US 5,399,238). Niigaki teaches a voltage supply between the anode and the gate. Tanaka and Niigaki teach every aspect of the invention except a diamond substrate unitary with the conical or pyramid tips. Kumar teaches a diamond substrate with unitary a conical and pyramid tip diamond emitters to reduce production causes. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the energy converter of Tanaka and Niigaki with the diamond substrate and tips of Kumar to reduce process steps during production.

9. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 5984752) and Niigaki et al. (Niigaki)(US 5959400), in further view of Kumar et al. (Kumar)(US 5,614,353). Tanaka and Niigaki teach every aspect of the invention except a polycrystalline structure with sp2 bonding. Kumar teaches a polycrystalline structure with sp2 bonding. Since Tanaka and Niigaki and Kumar are used in the field of field emission, it would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the emitter of Tanaka and Niigaki with sp2 bonds because Kumar teaches that sp2 bonds are common atomic bonds for emitters.

10. Claims 56, 59, and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 5984752) and Niigaki et al. (Niigaki)(US 5959400), in further view of Tavkelidze (US 6495843). Tanaka and Niigaki teach every aspect of the invention except a heat source and the load. Tavkelidze teaches the equivalence of the thermionic converter being a display, heat pump, or having a heat source/load to act as a generator. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the energy converter of Tanaka and Niigaki with the heat source and load to provide electricity to a load.

11. Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 5984752), Niigaki et al. (Niigaki)(US 5959400), and Tavkelidze (US 6495843), in further view of Kumar et al. (Kumar)(US 5,614,353). Tanaka, Niigaki, and Tavkelidze teach every aspect of the invention except a polycrystalline structure with sp2 bonding. Kumar teaches a polycrystalline structure with sp2 bonding. Since Tanaka, Niigaki, and Tavkelidze, and Kumar are used in the field of field emission, it would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the emitter of Tanaka and Niigaki with sp2 bonds because Kumar teaches that sp2 bonds are common atomic bonds for emitters.

Response to Arguments

12. Applicant's arguments filed 9/27/2004 have been fully considered but they are not persuasive. The Applicant's argument regarding the conical and pyramid tip shape represented in figure 14 is persuasive. The Applicant's argument that the hydrogen tip

termination is a chemical enhancement feature rather than a structural feature is not persuasive. The chemical enhancement is a structural limitation of the tip and must be show in the figures, see Niigaki (US 5959400) showing the hydrogen tip enhancement in the drawings. Applicant's argument regarding Geis in regards to claim 45 is not persuasive. Geis teaches the nitrogen doped diamond tip allows for efficient emission from the diamond tip to the vacuum (col. 6, lines 30-50). The doped diamond causes band bending providing the efficient emission, over non-doped diamond. Applicant's arguments with respect to remaining claims has been considered but are moot in view of the new grounds of rejection.

Conclusion

13. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karl I.E. Tamai whose telephone number is (571) 272 - 2036.

The examiner can be normally contacted on Monday through Friday from 8:00 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Darren Schuberg, can be reached at (571) 272 - 2044. The facsimile number for the Group is (703) 872 - 9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Karl I Tamai
PRIMARY PATENT EXAMINER
March 11, 2005

KARL TAMAI
PRIMARY EXAMINER